



(11) (21) (C) **2,237,939**
(22) 1998/06/29
(43) 1998/08/28
(45) 1999/09/21

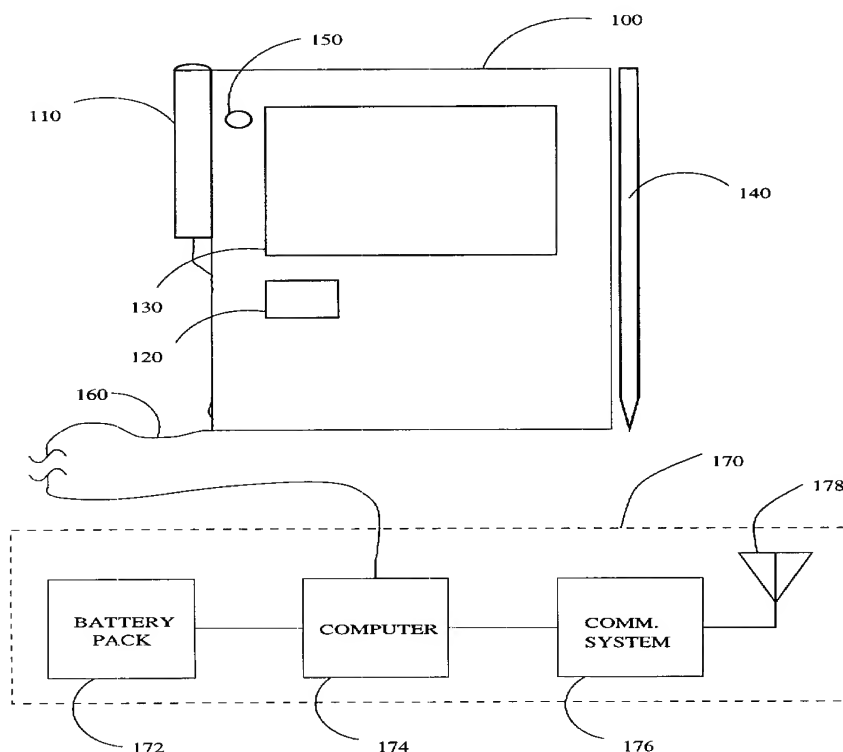
(72) MANN, Steve, CA

(73) MANN, Steve, CA

(51) Int.Cl.⁶ H04N 7/18, H04N 5/77, G06F 3/02, G03B 29/00

(54) **SYSTEME D'IMAGERIE PERSONNEL AVEC VISIONNEUSE ET
DISPOSITIF DE PRISE DE NOTES**

(54) **PERSONAL IMAGING SYSTEM WITH VIEWFINDER AND
ANNOTATION MEANS**



(57) L'invention est constituée par une nouvelle méthode et un nouvel appareil de photographie et de vidéographie de documents personnels. Elle porte particulièrement sur une caméra personnelle avec visionneuse et sur un système vidéo personnel de prise de notes. Cette caméra permet de tenir un journal personnel manuscrit ou un document similaire avec saisie vidéo à optimisation de l'angle de prise de vues. Ceci donne une nouvelle forme de journal personnel, ainsi qu'un nouveau type d'enregistrement vidéo de documents. Un client d'un établissement peut effectuer un enregistrement vidéo d'un préposé installé derrière un comptoir de telle façon que ce préposé ne puisse facilement déterminer si un enregistrement vidéo est effectué en même temps que l'enregistrement des notes manuscrites.

(57) A novel means and apparatus for personal documentary photography and videography is described. In particular, a personal camera with viewfinder means and a personal video annotation system is introduced. The camera system integrates the process of making a personal handwritten diary or the like, with the capture of video, from an optimal point of vantage and camera angle. This gives rise to a new form of personal diary, as well as a new genre of documentary video. Video of a subject such as an official behind a counter may be captured by a customer or patron of an establishment, in such a manner that the official cannot readily determine whether or not video is being captured with the handwritten notes or annotations.



Patent Application
of
Steve Mann
for
**PERSONAL IMAGING SYSTEM WITH VIEWFINDER AND
ANNOTATION MEANS**

of which the following is a specification:

—

FIELD OF THE INVENTION

The present invention pertains generally to a new photographic or video means and apparatus typically comprising a hand-held portable electronic camera system with viewfinder means and electronic pen-based annotation means.

BACKGROUND OF THE INVENTION

In photography (and in movie and video production), it is often desirable to capture events in a natural manner with minimal intervention or disturbance. In the present invention, the scenario to be considered is that of face-to-face conversation between two individuals, where one of the individuals wishes to make an annotated video diary of the conversation without disrupting the natural flow of the conversation. In this context, it is desirable to create a personal video diary or personal documentary, or to have some kind of personal photographic or videographic memory aid that forms the visual equivalent of what the electronic organizers and personal digital assistants do to help us remember textual or syntactic information.

Current state-of-the-art photographic or video apparatus creates a visual disturbance to others and attracts considerable attention on account of the gesture of bringing the camera up to the eye. Even if the size of the camera could be reduced to the point of being negligible (e.g. no bigger than the eyecup of a typical camera viewfinder, for example), the very gesture of bringing a device up to the eye is

unnatural and attracts considerable attention, especially in establishments such as department stores where photography is often prohibited. However it is in these very establishments in which a customer may wish, for example, to have a video record of the clerk's statement of the refund policy or the terms of a sale. Just as department stores often keep a video recording of all transactions (and often even a video recording of all activity within the establishment, sometimes including a video recording of customers in the fitting rooms), the goal of the present invention is to assist, for example, a customer who may wish to keep a video record of a transaction, interaction with a clerk, manager, refund explanation, or the like.

Although there exist a variety of covert cameras such a camera concealed beneath the jewel of a necktie clip, cameras concealed in baseball caps, and cameras concealed in eyeglasses, these cameras tend to produce inferior images, not just because of the technical limitations imposed by their small size, but, more importantly because they lack a viewfinder means (e.g. means of viewing the image to adjust camera angle for best composition). Because of the lack of viewfinder means, the subject matter is not necessarily centered well in the viewfinder, or even captured by the camera, and thus these covert cameras are not well suited to personal documentary or for use in a personal photographic/videographic memory assistant.

A wearable camera system (called WearCam) has been proposed in, for example, IEEE Computer, Vol 30, No 2, or equivalently <http://wearcam.org/ieeecomputer.html> (see also <http://wearcomp.org/wearpubs.html>). Unfortunately embodiments of the WearCam invention typically require special preparation such as special clothing, and special wiring of the body a-priori. Such systems will work for those dedicated to being constantly wired with various computational and sensory apparatus incorporated into special clothing, but there are a good many individuals who may wish to obtain the same convenience without a change of lifestyle.

Accordingly, what is proposed is a camera and viewfinder means for unobtrusively capturing video of exceptionally high compositional quality and possibly even artistic

merit, and some embodiments of this invention that are hand-held rather than body-worn.

In addition to the fact that covert versions of the apparatus can be used to create investigative documentary videos having very good composition, the device need not necessarily be covert. Instead, it may merely be designed so that the subject of the picture or video cannot readily determine whether or not the apparatus is in use recording. Just as department stores and the like often have dark domes on their ceilings, so that customers do not know whether or not there are cameras in the domes (or which ones have cameras and even which way the cameras are pointed if there are cameras in the domes), the proposed invention creates a situation in which a department store clerk or the like will not know whether or not a customer's personal memory assistant is recording video. This uncertainty is created by having the camera positioned so that it will typically be pointed at a person at all times, whether or not it is actually being used.

BACKGROUND OF THE INVENTION WITH RESPECT TO PRIOR ART: The invention is related to the Personal Digital Assistant (PDA) such as the Palm Pilot, the so-called "Paper-Based AudioNotebook" (Lisa J. Stifelman Augmenting Real-World Objects: A Paper-Based Audio Notebook CHI'96 Conference Companion, pp. 199-200, April 1996), and the general ideas of pen-based computing.

There is also an important connection to portable computers, mobile computing, and wearable computers (See for example, IEEE Computer, Vol 30 No 2).

DESCRIPTION OF THE INVENTION

A typical embodiment of the invention comprises a hand-held pen-based computer or a combination clipboard and pen-based computer input device, hereafter referred to as "clipboard" (whether it be an electronic organizer, PDA, or a real pen and paper clipboard into which some electronic devices have been added).

A camera is built into the clipboard with the optical axis of the lens facing the direction from bottom to top of the clipboard, so that during normal face-to-face conversation, the person holding the clipboard will tend to point the camera at the other person while taking written notes of the conversation. In this manner, the intentionality (whether or not the person taking written notes is intending to point the camera at the other person) is masked by the fact that the camera will always be pointed at the other person by virtue of its placement in the clipboard. Thus the camera lens opening need not necessarily be covert, and in fact, could be deliberately accentuated (e.g. made more visible) if desired. To understand why it might be desirable to make it more visible, one can look to the cameras in department stores, which are often placed in large dark smoked plexiglass domes. In this way they are neither hidden nor visible, but rather, they serve as an uncertain deterrent to criminal conduct. While they could easily be hidden inside smoke detectors, ventilation slots, or small openings, the goal of the dome is to make the camera conceptually visible yet completely hidden. In a similar manner, a large lens opening on the clipboard may, at times, be desirable, so that the subject will be reminded that there could be a recording, but will be uncertain as to whether or not such a recording is actually taking place. Alternatively, a large dark shiny plexiglass strip, made from darkly smoked plexiglass (typically 1cm high and 22cm across) is installed across the top of the clipboard, as a very subtle yet visible deterrent to criminal behaviour and disrespect. One or more miniature cameras are then installed behind the dark plexiglass, looking forward through it. In other embodiments, a camera is installed in a PDA, and then the top of the PDA is covered with dark smoky plexiglass.

The clipboard is fitted with an electronic display system which includes the capability of displaying the image from the camera, so that it can serve as a viewfinder for aiming the camera at the subject. Moreover, the display is typically constructed so that it is visible only to the user of the clipboard, or, at the very least, so that the subject of the picture cannot readily see the display. Such concealment of the display

may be accomplished through the use of a honeycomb filter placed over the display. Such honeycomb filters are common in photography, where they are placed over lights to make the light sources behave more directionally. They are also sometimes placed over traffic lights where there is a wye intersection, so that the lights can only be seen from one direction, for example, so that the traffic lights do not confuse drivers on another branch of a wye intersection that faces almost the same way. Alternatively, the display may be designed to provide an inherently narrow field of view, or other barriers may be constructed to prevent the subject from seeing the screen.

The function of the camera is integrated with the clipboard so that textual information, as well as drawings, may be stored in a computer system, together with pictures or videoclips (hereafter still pictures and segments of video will both be referred to as videoclips, with the understanding that a still picture is just a video sequence which is one frame in length).

Since videoclips are stored in the computer together with other information, these videoclips may be recalled by an associative memory working together with that other information. Thus tools like the UNIX “grep” command may be applied to videoclips by virtue of the associated textual information which typically resides as a videographic header. In this way, for example, one could grep for the word “meijer”, and may find various videoclips taken during conversations with clerks in the Meijer department store. Thus such a videographic memory system may give rise to a memory recall of previous videoclips taken during previous visits to this particular department store, provided that one has been diligent enough to write down (e.g. enter textually) the name of the department store upon each visit.

Videoclips are typically time-stamped (e.g. there exist file creation dates) and GPS-stamped (e.g. there exists global positioning system headers from last valid readout) so that one can search on setting (time+place).

Thus the video clipboard may be programmed so that the act of simply taking notes causes previous related videoclips to play back automatically in a separate

window (in addition to the viewfinder window which should always remain active for continued proper aiming of the camera). Such a video clipboard may, for example, assist in a refund explanation by providing the customer with an index into previous visual information to accompany previous notes taken during a purchase. This system is especially beneficial when encountering department store representatives who do not wear name tags and who refuse to identify themselves by name (as is often the case when they know they have done something wrong such as disrespect a customer).

SUMMARY OF THE INVENTION: OBJECTS AND ADVANTAGES

It is an object of this invention to provide a method of positioning a camera to take a picture or video of a subject without the subject's knowledge or at least without the subject's being certain as to whether or not said picture or video is being taken.

It is a further object of this invention to provide a means of recording a picture or video where the spatial extent (field of view) of the image may be ascertained without having to hold any device up to the eye.

It is a further object of this invention to provide such a method of taking a picture or video where the tonal characteristics of the picture may be ascertained without having to hold any device up to the eye.

It is a further object of this invention to provide such a method of taking a picture or video where no apparent difference in body movement or gesture between when a picture is being taken and when no picture is being taken is detectable by others.

It is a further object of this invention to provide the user with a means of determining the composition of the picture from a display device that is located such that only the user can see the display device, and so that the user can ascertain the composition of a picture or take a picture or video and transmit image(s) to one or more remote locations without the knowledge of others in the immediate environment, or without others in the environment being certain whether or not such picture or video is being captured.

It is a further object of this invention to provide a means and apparatus for a user to capture a plurality of images of the same scene or objects, in a natural process of simply sliding a small object around on a countertop, and then have these images combined together into a single image of increased spatial extent, spatial resolution, dynamic range, or tonal fidelity.

It is a further object of this invention to provide a camera with viewfinder means for collaboration between the user of the apparatus and one or more other persons at remote locations through the manipulation of virtual objects such as cursors, or computer graphics renderings displayed upon the camera viewfinder.

It is a further object of this invention to allow multiple users of the invention, whether at remote locations or side-by-side, or in the same room within each other's field of view, to interact with one another through the collaborative capabilities of the apparatus.

It is a further object of this invention to allow multiple users of the invention, at remote locations, to collaborate in such a way that a virtual environment is shared in which camera-based camera-tracking of each user results in acquisition of video and subsequent generation of virtual information being made available to the other(s).

It is a further object of this invention to allow multiple users of the invention, at the same location, to collaborate in such a way that multiple camera viewpoints may be shared among the users so that they can advise each other on matters such as composition, or so that one or more viewers at remote locations can advise one or more of the users on matters such as composition or camera angle.

It is a further object of this invention to allow multiple users of the invention, at different locations, to collaborate on a project or endeavour that may not pertain to photography or videography directly, but a project or endeavour nevertheless that is enhanced by the ability for each person to experience the viewpoint of another.

It is a further object of this invention to allow one or more remote participants at conventional desktop computers or the like to interact with one or more users of the

invention, at one or more other locations, to collaborate on a project or endeavour that may not pertain to photography or videography directly, but a project or endeavour nevertheless that is enhanced by the ability for one or more users of the invention to either provide or obtain advice from or to another individual at a remote location.

It is a further object of this invention to facilitate a very close-up camera angle, from slightly below the subject of the picture or video, most notably so that the camera can be brought closer to the subject than would be acceptable for the body of the camera operator, so that the personal space of the subject can be violated more effectively than with a body-worn camera such as that of the WearCam invention.

It is a further object of this invention to facilitate the creation of a database comprising video records linked to associated hand-written notes.

It is a further object of this invention to facilitate the creation of video records linked to associated capture of handwriting and other information in and around the immediate environment.

SUMMARY OF THE INVENTION: Informal review of what the new invention does

One aspect of the invention allows the user to take notes with pen and paper (or pen and screen) and continuously record video together with the written notes. Even if there is insufficient memory to capture a continuous video recording, the invention can be designed so the user will always end up with the ability to produce a picture from something that was seen a couple of minutes ago. This may be useful to everyone in the sense that we may not want to miss a great photo opportunity, and often great photo opportunities only become known to us after we have had time to think about something we previously saw. At the very least, if for example, a department store owner or manager becomes angry and insulting to the customer, the customer may retroactively record the event, by opening a circular buffer.

Such an apparatus might also be of use in personal safety. Although there are a growing number of video surveillance cameras installed in the environment allegedly

for “public safety”, there have been recent questions as to the true benefit of such centralized surveillance infrastructures. Most notably there have been several examples in which such centralized infrastructure has been abused by the owners of it (as in roundups and detainment of peaceful demonstrators). Moreover, “public safety” systems may fail to protect individuals against crimes committed by members of the organizations that installed the systems. Accordingly, embodiments of the invention often implement the storage and retrieval of images by transmitting and recording images at one or more remote locations. In one embodiment of the invention, images were transmitted and recorded in different countries, so that they would be difficult to destroy, in the event that the perpetrator of a crime or other misconduct might wish to do so.

The invention allows images to be captured in a natural manner, without giving an unusual appearance to others (such as an abusive official).

Moreover, as an artistic tool of personal expression, the apparatus allows the user to record, from a new perspective, experiences that have been difficult to so record in the past. For example, a customer might be able to record an argument with a fraudulent business owner from a very close camera angle. This is possible because a clipboard may be extended outward toward the person without violating personal space in the same way as might be necessary to do the same with a camera hidden in a tie clip, baseball cap, or sunglasses. Since a clipboard may extend outward from the body, it may be placed closer to the subject than the normal eye viewpoint in normal face-to-face conversation. As a result, the camera can capture a very close-up view of the subject. Such a view is often more desirable than the view obtainable from a telephoto lens located in eyeglasses (e.g. telephoto embodiment of the WearCam invention) because the close-up view also provides a dramatic and powerful composition, from underneath the subject’s face, and is therefore most suitable, cinematographically, for capturing the menacing nature of a corrupt or disrespectful official.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of examples which in no way are meant to limit the scope of the invention, but, rather, these examples will serve to illustrate the invention with reference to the accompanying drawings, in which:

FIG. 1 is a diagram of a simple embodiment of the invention in which there is a camera borne by a personal digital assistant (PDA) which has a separate display attached to it to function as a viewfinder for the camera.

FIG. 2 is a diagram of an alternate embodiment of the camera system in which a graphics tablet is concealed under a pad of paper and an electronic pen is concealed inside an ordinary ink pen so that all of the writing on the paper is captured and recorded electronically together with video from the subject.

FIG. 3 illustrates a wristwatch embodiment of the invention in which a camera concealed inside the watch sends video to a covert body-worn computer system which transmits the video to a remote site where it is processed by one or more remote experts and advice from the remote expert(s) is displayed on a computer screen on the face of the watch together with time, date, and video from the camera (for viewfinder purposes).

FIG. 4 depicts a close-up view of the wristwatch display, which happens to be the display of a body-worn computer running XFree86 on top of the Linux operating system, which facilitates the display of an "xclock" together with other material such as video from the camera (so the display can function as a viewfinder), and various menu items suitable for a wristwatch videotelephone.

While the invention shall now be described with reference to the preferred embodiments shown in the drawings, it should be understood that the intention is not to limit the invention only to the particular embodiments shown but rather to cover all alterations, modifications and equivalent arrangements possible within the scope of appended claims.

In all aspects of the present invention, references to “camera” mean any device or collection of devices capable of simultaneously determining a quantity of light arriving from a plurality of directions and or at a plurality of locations, or determining some other attribute of light arriving from a plurality of directions and or at a plurality of locations. Similarly references to “display” shall not be limited to just television monitors or traditional televisions used for the display of video from a camera near or distant, but shall also include computer data display means, computer data monitors, other video display devices, still picture display devices, ASCII text display devices and the like.

References to “video” shall include any signal that includes one or more streams of visible pictures, together with one or more audio channels from one or more microphones. Thus the term “video” may, for example, refer to a signal recorded from two cameras and several microphones arranged in an array, to be later processed for beamforming purposes or to be processed in such a way as to project a nullspace toward unwanted audible interference such as the sound of a vacuum cleaner in the appliances section of a Sears department store during the shooting of a documentary video there. The term “video” shall also be taken to include intermediate representations of signals derived from cameras, microphones, and associated auxiliary sensors. Examples of such intermediate representations shall include, but not be limited to, recording of some number M of audio channels from some number N of microphones, where M may be less than N . Examples of “video” may also include image representations from multiple electromagnetic sensors represented as a single signal.

DETAILED DESCRIPTION OF THE INVENTION WITH REFERENCE TO DRAWINGS

Fig 1 shows an embodiment of the invention built into a PDA 100. A video camera 110 captures a view of a person standing in front of the user of the PDA and displays the image on an auxiliary screen 120, which may be easily concealed by the user's

hand while the user is writing or pretending to write on the PDA's screen 130 with pen 140. In commercial embodiments of the invention the auxiliary screen 120 may not be necessary, as it may be implemented as a window displaying the camera's view on a portion of the main screen 130. Annotations made on screen 130 with pen 140 may also be captured and stored together with videoclips from camera 110, so that there is a unified database in which the notes and annotations are linked with the video. An optional second camera 150 may be used if the user wishes to make a video recording of himself/herself while recording another person with camera 110. In this way, both sides of the conversation may be simultaneously recorded by the two cameras, so that the resulting recordings could be edited later, so that there could, for example, be a cut back and forth between the two cameras to follow the natural flow of the conversation. Such a recording might, for example, be used for an investigative journalism story on corrupt department store owners who illegally chain their fire exits shut. In the early prototypes, an additional wire 160 was run up the sleeve of the user into a separate body worn pack 170 powered by its own battery pack 172. The body worn pack typically contains a computer system 174 which houses video capture hardware and is connected to a communications system 176 comprising packet radio terminal node controller (high level data link controller with modem) and radio, which typically establishes an Internet connection by way of antenna 178. The body-worn pack 170 would likely disappear in the final embodiment of the invention which would contain the functionality of the pack 170 inside the hand-held device 100.

Fig 2 depicts an alternate embodiment of the invention depicted in Fig 1 in which the invention is built into an ordinary clipboard 200. Video camera 210 displays on a miniature screen 220 mounted to the clipboard. A folded back piece of paper 230 conceals the screen 220. The rest of the sheets of paper 231 are placed slightly below the top sheet 230, so that the user can write on them in a natural fashion. From the perspective of someone facing the user (the subject), the clipboard will have the

appearance of a normal clipboard in which the top sheet 230 appears to be part of the stack 231. Pen 240 is a combined electronic pen and real pen, so that the user can simultaneously write on the paper with real ink, as well as make an electronic annotation by virtue of a graphics tablet below the stack of paper 231, provided that the stack is not excessively thick. In this way there is a computer database linking the real physical paper with its pen strokes and the video recorded of the subject. From a legal point of view, real physical pen strokes may have some forensic value that the electronic material may not (e.g. if the department store owner asks the customer to sign something, or even just to sign for a credit card transaction, the customer may place it over the pad 231 and use the special pen 240 to capture the signature in the customer's own computer and index it to the video record). Wire 260 going from the clipboard, up the sleeve of the user, would be eliminated through construction of a self-contained video clipboard.

Fig 3 depicts a wristwatch embodiment 300 of the invention depicted in Fig 1. Camera 310 points forward such that, for example, while a customer is wearing the wristwatch embodiment of the invention and is standing at a counter, he or she can place his or her arm naturally upon the counter and aim the camera 310 at the official behind the counter without appearing unusual. The video of the official seen by camera 310 is displayed on display unit 320, so that display unit 320 functions as a viewfinder to assist the customer in aiming the camera 310. An optional second camera 350 may be included if the customer wishes to record himself/herself so that both sides of the conversation would be recorded. Cabling 360 runs from the camera(s) 310 (and 350) inside the wrist strap, emerging at the back of the wrist strap where it will be concealed from view by the official. Cabling 360 runs up the sleeve of the wearer of the watch, to an internet-connected body-worn computer system, the output of which runs back down cabling 360 out to the display 320. In this way video from camera 310 may be transmitted and recorded at remote sites, while the wearer of the wristwatch may be advised by a remote legal expert on the best approach for

dealing with the corrupt or disrespectful official. In future embodiments, the cabling 360 may be eliminated, so that the unit would be either entirely self-contained, or would communicate wirelessly with a body-worn computer/repeater/internet gateway station or a computer/repeater/internet gateway station carried in a briefcase or the like.

Interaction with the wristwatch version of the invention depicted in Fig 3 may be done through a pen-based or touch-based interface to the screen, in the form of a so-called “pie menu” as described in Callahan, Hopkins, Weiser and Shneiderman, 1988, or by using a “unistroke shorthand” as invented by Goldberg and Richardson, 1993.

Fig 4 depicts a natural choice of pie menu for a wristwatch display. Display 400 is typically a computer screen with 480 pixels down and 640 pixels across, measuring approximately 0.7 inches on the diagonal. Upon display 400 is the image of a clock face, superimposed on top of a video signal from the camera. Time is displayed as a video picture, similar to the way that time is displayed on a UNIX workstation using the “xclock” program. Thus the “hands” of the clock 410 are realized by a video image in which pixels are darker (or lighter) in the region of the hands, and in this way the embodiment of the camera invention tells time. In the figure depicted here, the time is 4:03. Thus the device truly looks like an ordinary wristwatch (although one in which the hands are displayed electronically) because it is in fact a wristwatch, among other things. It is natural for such a wristwatch to have a circle 420 displayed on the screen, and to have numbers 430 displayed around the periphery of said circle. In this way it is easier to tell time, and also the numbers may be assigned a secondary meaning (e.g. select “0” to stop recording, “4” to kill all processes and halt the processor, “7” to wake up the system from sleep mode, etc.).

Since humans are quite good at telling time, often the numbers are missing from many commercial wristwatches, and some wristwatches do not even have markings for each hour. Instead, we often rely on our heightened sense of visual acuity to discern

the angle of the hands upon the clockface. Thus it is no surprise that the clock menu is usable without paying much attention to the face of the clock. The user just needs to stroke the face of the clock in the direction desired (e.g. stroke the clockface in the 2:00 direction to enter the number "2").

The entry of numbers on a touch sensitive clockface in the context of the current invention may be done as vectors (e.g. with no regard to location, only regard to direction). Thus a stroke from left to right is regarded as the number "3" regardless of where the stroke begins or ends. A downwards stroke (e.g. from top to bottom) is regarded as the number "6" regardless of where the stroke begins or ends, and so on.

Thus telephone numbers can be easily entered into the device, and similarly an alphabet 440 can be constructed much like the alphabet of an automated DTMF answering system used for voicemail and the like in telephony.

Such a menu may be implemented with touchscreen, or alternatively small push-buttons around the periphery of the clock face may be used. Since there are 12 pushbuttons on a telephone, and there are also 12 hours on a clock face, there can be a one to one correspondence between the numbers of the clockface and those of the telephone. The hours 10:00 and 11:00 are used for the symbols "*" and "#" of the telephone touchpad.

The data entered by way of the clock face menu is typically combined with the video recording made from the scene. Of course the amount of information taken down may be less than that in the embodiments of the invention described in Fig 1 and Fig 2, but the clock face menu is sufficient for entering a department store manager's name, which may be appended to the video file header, so that later a large database of recorded video may be navigated using these short text headers. Of course GPS and file creation are also important as in the other embodiments of the invention. Moreover, due to direct contact between the watch and the body, the pulse (heart rate), as well as skin conductivity (sweatiness index) of the wearer may be determined and this information may be appended to or recorded with the video signals. This

may facilitate, for example, a future search through all video in which the wearer's heart rate exceeds a certain threshold. It has been found that when a department store manager is dishonest with respect to refund policies, or a clerk refuses to tell a customer his/her name, that the customer's heart rate increases dramatically, and the customer often sweats profusely. Thus this extra information can later help locate moments of tension in a previously recorded argument at the refund counter.

BENEFITS OF THE INVENTION

The vast proliferation of video surveillance throughout various establishments such as department stores, public parks, streets, and even changerooms (Newsweek, July 17, 1995) is propagated with a promise to a better, safer world. However, representatives and architects of this surveillance superhighway may continue to be corrupt. For example, although cameras reduce and deter shoplifting, there continue to be situations where shopkeepers illegally chain shut fire exits, or refuse to be accountable in other ways (such as making promises with respect to refund policy and then failing to keep these promises later). Extreme situations include the murder of a customer suspected of (and falsely accused of) shoplifting by a department store owner (see, for example, the Latasha Harlins case) where the department store owner shot the customer in the back as she turned to walk out of the store.

Thus one benefit of the invention is to provide personal safety, and to ensure accountability to those who might otherwise escape accountability. These benefits are especially useful in a totalitarian regime (a regime which wishes to know everything about others but reveal nothing about itself). A typical department store (where video surveillance is used extensively yet photography and video by customers is prohibited) is a prime example of where the proposed invention may assist in providing some degree of balance with respect to mutual accountability.

Furthermore, the invention is useful as a new communications medium, in the context of collaborative photography, collaborative videography, and telepresence.

One way in which the invention can be useful for telepresence is in the creation of video orbits (collections of pictures that exist in approximately the same orbit of the projective group of coordinate transformations). A video orbit can be constructed using the clipboard embodiment in which a small rubber bump is made on the bottom of the clipboard right under the camera's center of projection. In this way, when the clipboard is rested upon a surface such as a countertop, it can be panned around this fixed point, so that video recorded from the camera can be used to assemble a panorama or orbit of greater spatial extent than a single picture. Similarly with the wristwatch embodiment, a small rubber bump on the bottom of the wristband allows the wearer to place the wrist upon a countertop and rotate the entire arm and wrist about a fixed point. Either embodiment is very well suited to shooting a high quality panoramic picture or orbit of an official behind a high counter, as is typically found at a department store, bank, or other organization.

Moreover, the invention may perform other useful tasks such as functioning as a personal safety device and crime deterrent by virtue of its ability to maintain a video diary transmitted and recorded at multiple remote locations. As a tool for photo-journalists and reporters, the invention has clear advantages over other competing technologies.

OTHER EMBODIMENTS

From the foregoing description, it will thus be evident that the present invention provides a design for a hand-held or wrist-worn camera with viewfinder means. As various changes can be made in the above embodiments and operating methods without departing from the spirit or scope of the following claims, it is intended that all matter contained in the above description or shown in the accompanying drawings should be interpreted as illustrative and not in a limiting sense.

Variations or modifications to the design and construction of this invention, within the scope of the appended claims, may occur to those skilled in the art upon reviewing

the disclosure herein. Such variations or modifications, if within the spirit of this invention, are intended to be encompassed within the scope of any claims to patent protection issuing upon this invention.

CLAIMS

The embodiments of the invention in which I claim an exclusive property or privilege are defined as follows:

1. A hand-held video clip board system comprising a flat clipboard, processor, an electronic display connected to an output of said processor, and a camera connected to an input of said processor, where said video clip board system comprises said display attached to said clipboard such that writing paper may be also attached to said clipboard to conceal said display from a person standing in front of the user of said clipboard when said clipboard is held in a normal position for writing, and where said camera will face said person standing in front of user of said clipboard when said clipboard is held in a normal position for writing, and where said video clip board system includes means for simultaneously taking hand written notes and capturing video signals from said camera.
2. A hand-held video clip board system as described in Claim 1 further comprising a graphics tablet where said graphics tablet is located below a pad of paper upon said clipboard, and a special pen where said special pen includes means of marking, in ink, a sheet of paper on said pad of paper and where said special pen may be simultaneously tracked by said graphics tablet.
3. A hand-held video clip board system as described in Claim 1 further comprising a graphics tablet and graphics pen where said graphics pen includes means for electronic drawing and writing upon said graphics tablet, and where said graphics pen also includes real ink for writing on real paper while providing said electronic drawing and writing means.
4. A videographic memory system including a hand-held video clip board system as described in Claim 3 where said video signals and data pertaining to said

electronic drawing and writing means are both stored each time the clipboard is used, and further including means of electronic query of said data for corresponding handwritten notes or corresponding video signal recordings.

5. A wristwatch videoconferencing system comprising a housing worn on the wrist, where said housing contains a display in a flat face of said housing, where said display is connected to an output of a processor, and where said housing also contains a camera connected to an input of said processor, where said display is responsive to an output of said camera.
6. Means and apparatus for a wristwatch videoconferencing system comprising a thin housing worn on the wrist, where said housing contains a display in a flat face of said housing, where said display is connected to an output of a wirelessly networked body-worn processor, and where said housing also contains a camera connected to an input of said body-worn processor, where said body-worn processor is responsive to either an output of said camera, or an output of a camera worn by another wearer of an identical apparatus.
7. Means and apparatus for a wristwatch videoconferencing system comprising a thin housing worn on the wrist, where said housing contains a display in a flat face of said housing, where said display is connected to an output of a processor, and where said housing also contains a camera connected to an input of said processor, where said camera is mounted in said housing such that when the wearer of said housing is looking at said display in a manner similar to the manner that one normally looks at a wristwatch, that said camera will be pointed at a person standing in front of said wearer of said housing.
8. A wristwatch video conversation capture system comprising means and apparatus described in Claim 7 where said camera is a first camera, and where said wristwatch video conversation capture system includes a second camera where said second camera is mounted in said housing such that when the wearer of

said housing is looking at said display in a manner similar to the manner that one normally looks at a wristwatch, that said second camera will be pointed at the face of said wearer.

9. A wristwatch videoconferencing system comprising means and apparatus described in Claim 7 where said wristwatch videoconferencing system includes means for wireless transmission of the video signals from said camera to at least one remote location.
10. A wristwatch videoconferencing system comprising means and apparatus described in Claim 7 where said processor is a computer system wirelessly connected to a computer network, and where said wristwatch videoconferencing system includes means of transmitting video signals to a remote location while interacting with one or more remote entities by way of said display.
11. A wristwatch video recording system comprising means and apparatus described in Claim 7 where said processor is a computer system including means for recording video signals from said camera, and where said wristwatch video recording system includes means for interacting with said display to control the recording process.
12. A wristwatch videotelephone comprising means and apparatus described in Claim 7 where said processor is a computer system wirelessly connected to a computer network, and where said wristwatch videotelephone system includes means of transmitting video signals to a remote location while interacting with said computer system by way of said display.
13. A wristwatch videotelephone as described in Claim 12 where said means of interacting with said computer system by way of said display comprises data entry using a pie menu.

14. A wristwatch videotelephone as described in Claim 12 where said means of interacting with said computer system by way of said display comprises data entry using a pie menu in which the wearer of the apparatus is presented with 12 choices.
15. A wristwatch videotelephone as described in Claim 14 where said 12 choices include the numerals 0 through 9 corresponding with the hours from midnight through 9:00.
16. A wristwatch videotelephone as described in Claim 14 where said 12 choices include the numerals 0 through 9 corresponding with the hours from midnight through 9:00 and the symbols "*" and "#" corresponding with the hours of 10:00 and 11:00.
17. A video orbits capture system including a hand-held video clip board as described in Claim 1, where said video orbits capture system further includes means of limiting the movement of said clipboard to a constrained movement when placed upon a surface, where said constrained movement permits said camera to undergo approximately pure rotation, where the central axis of said rotation corresponds to a point close to the center of projection of said camera.
18. A wristwatch videoconferencing system as described in Claim 5 where said wristwatch videoconferencing system further includes means of placement of said wrist upon a surface for rotation of said wrist approximately about a single point of rotation, and where said point of rotation is close to the center of

projection of said camera.

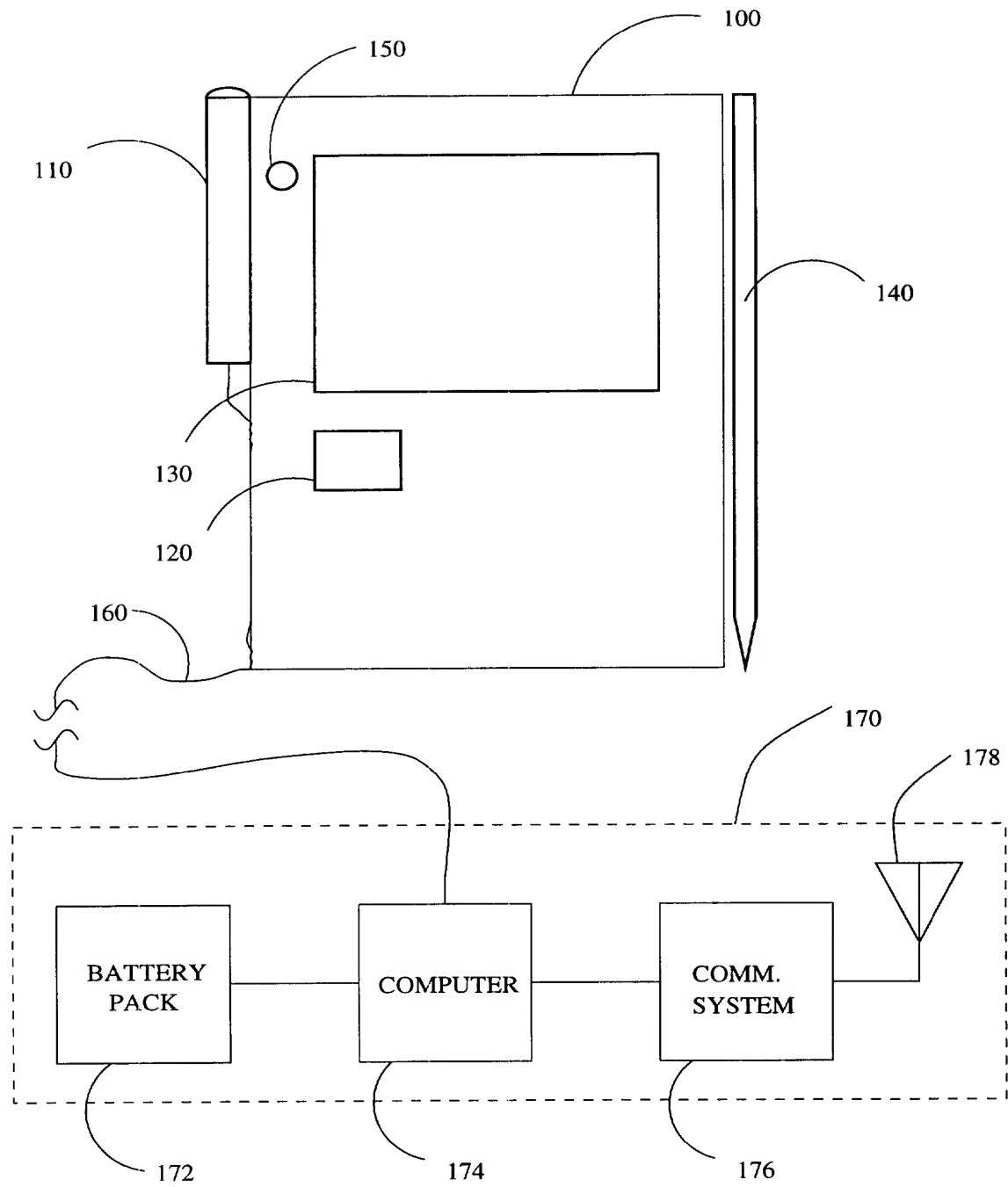


FIGURE 1: PDA-BASED VIDEO RECORDING/ANNOTATION SYSTEM

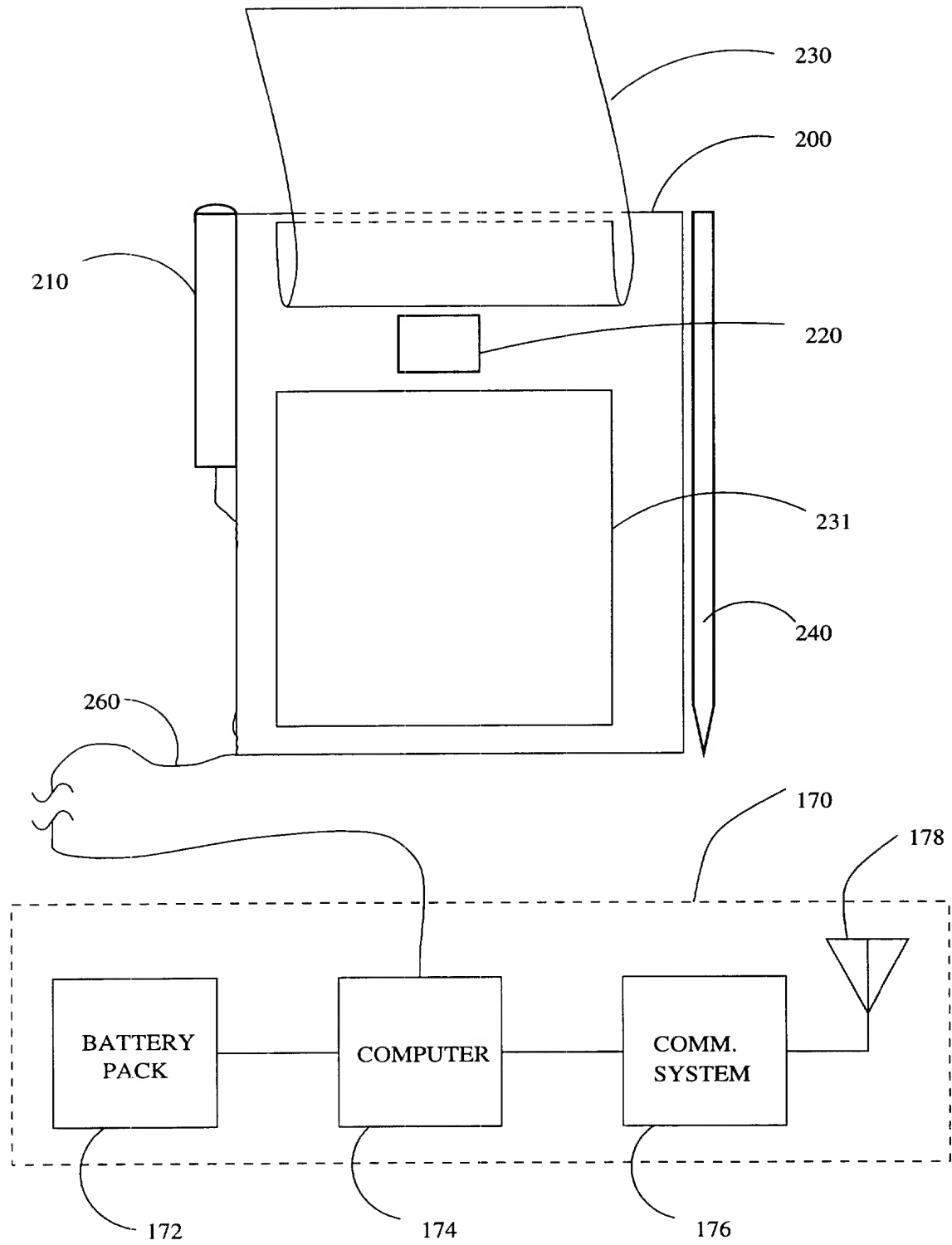


FIGURE 2: VIDEO CLIPBOARD

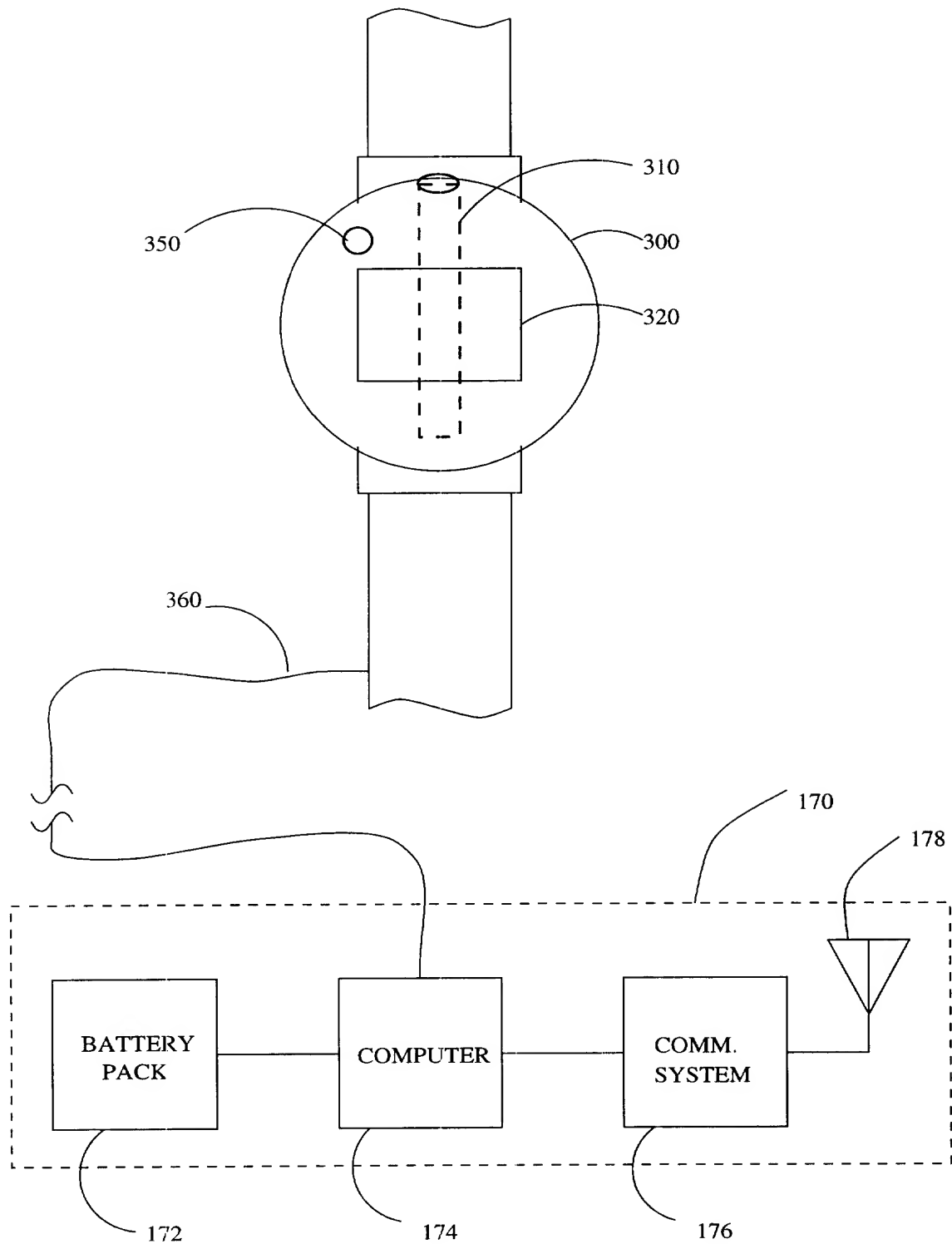


FIGURE 3: WRISTWATCH VIDEOCONFERENCING AND COLLABORATIVE RECORDING SYSTEM

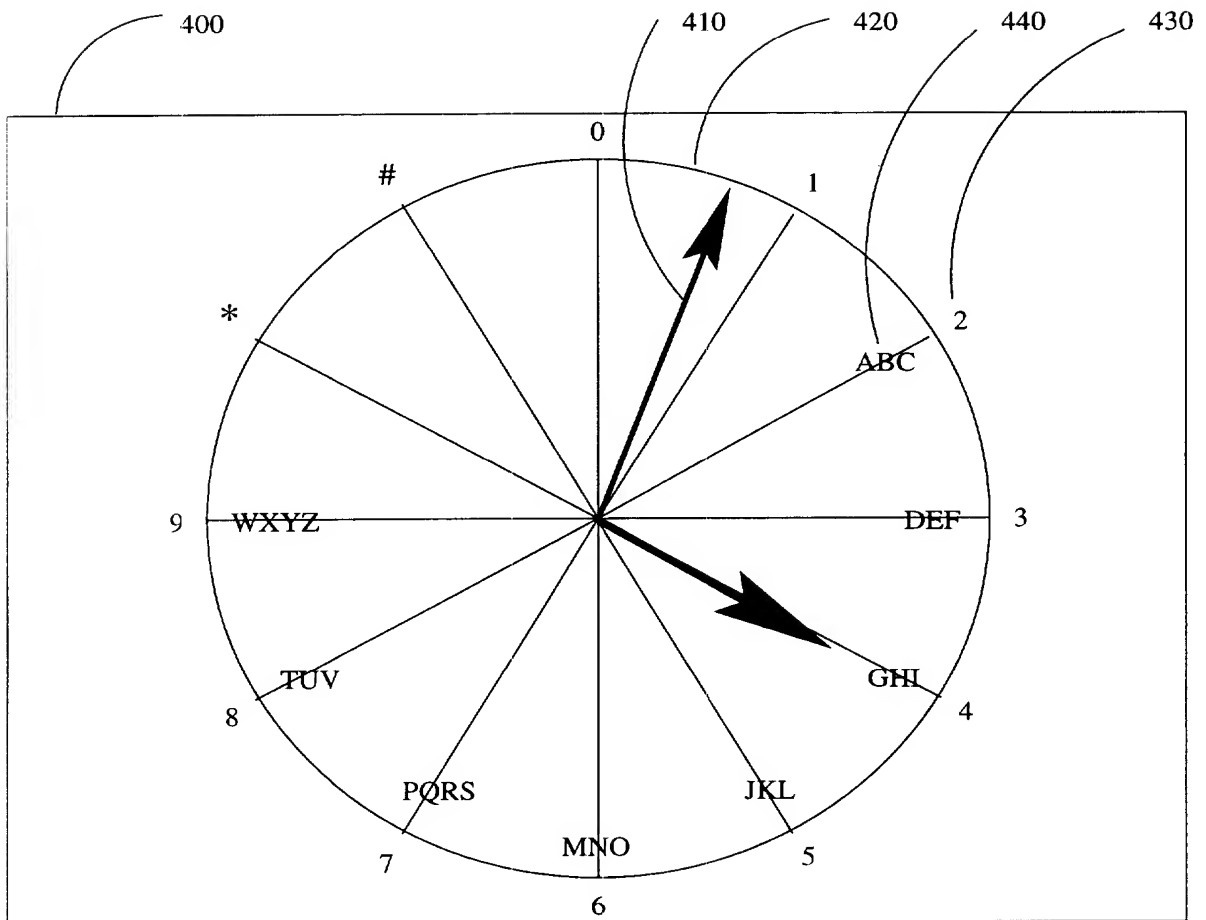


FIGURE 4: WRISTWATCH VIDEOCONFERENCING MENU